

Universe Cycles
Expansion (Birth) & Contraction (Death)

Parallels of Analysis
The Original Teachings of the Buddha
&
Physicists Recent Discoveries



AGGAÑÑA SUTTA

Evolution Of The Universe



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5TH SEPTEMBER 2011

Well, we were going to start talking about the “*Aggañña Sutra*”, but today we are not going to start that because we will be giving you a rest. Because we have been going through the “*Paṭicca-Samuppāda*”, “*Paṭicca-Samuppāda*” was fairly difficult thing to understand, and you should be thinking about it, and you could ask questions about it, instead of just passing it on without thinking much about it.

Because this, the teaching of the Buddha is based on this "*Paṭicca-Samuppāda*", and so "*Paṭicca-Samuppāda*" to understand this fully it is important to understand what is today called the Theory of Evolution. And to know about the Theory of Evolution properly, we must know what we call Life. Most people think Life is Consciousness. Consciousness and Life are two different things. And today's there is a field of Science called Biology. Now Biology is the study of Life: "bio" means "Life"; "logy" means "the Study". So Biology means the Study of Life.

So we have to understand the scientific meaning of this word that we call Life. So when we use the word Life what are we really talking about? What we call Life is not Consciousness. Life is a process that is going on unconsciously. There's no Consciousness in Life. Life is simply an Activity. And before we can even talk about this Activity called Life, we have to know what we call an Activity. And to understand what we call an Activity, we have to get into a different field of Science, which is called Physics and even Chemistry. Now what we call Life; I mean what we call activity is what is today call Energy. If there is no Energy, there is no Activity, so this thing called Energy must be understood, and to understand what we call Energy, we have to understand what is called Physics.

Physics is where we deal with energy. Chemistry is mainly dealing with what we call Matter. So there are two important things matter and energy. So if we don't understand what Matter is, we can't understand what Energy is. So these fundamental things if you are not properly familiar with these things, it is very difficult to understand even what is called the "*Paṭicca samuppāda*". Because the Buddha is not an ordinary person, he's a very advanced person; he's even more advanced than the modern scientists. All the modern discovery of science is a repetition of what the Buddha has already said. So it is very important to understand that.

Of course the Buddha never spoke about everything that the modern scientists are talking about because the people were not ready to understand it. But if the Buddha was talking now, he would be able to explain things very much better. Because the modern people who are familiar with science they can understand the Buddha better, but the problem is that a Buddha doesn't appear at a time like this because even if you understand what the Buddha is saying you cannot practice it. This is why today we don't have people like the Buddha or even people like the “*Arahants*” because the modern people are so much attached to pleasures and comforts. So it is by giving up this attachment to pleasure and comfort that we can really begin to practice.

So somehow we have to be able to understand at least what the Buddha has been trying to say. And today it's about more than 2500 years after the Buddha, and the teaching of the Buddha has been adulterated because the teaching has got mixed up with other philosophies and cultures in the world. And because of this, the teaching of the Buddha has become polluted. So this is why it is very important to, if you want to understand the real teaching of the Buddha, we have to rediscover the teaching of the Buddha. But still it is possible to understand at least to some extent because the complete teaching of the Buddha has not disappeared, and we do have some translations, but the translations are not perfect. So this is why the difficulty for the beginner to understand the teaching of the Buddha. So this is why we are discussing in this way.

So here we are today only trying to talk about the Origin of the Universe, and “*Aggañña Sutra*” really is about the Origin of the Universe, and not only the Origin of the Universe, it is also talking about the origin of the thing called Life; it's talking about this. Now in some books about Buddhism, written especially by Westerners, they said the Buddha never spoke about the beginnings, but that is not true. The most important thing that the Buddha taught was about the beginning, but he didn't speak about the beginning like what you hear in the Bible that God created the world that is not how the Buddha spoke about the beginning.

To understand the beginning first you have to understand what is today called Matter and Energy because everything in the world is known to the modern scientists as Matter and Energy. And Matter is found in today, Matter is seen as in three forms: Solids, Liquids, and Gases; Solids, Liquids, and Gases. And the latest findings they're adding another one called Plasma, so Solid, Liquid, Gases, and Plasma. So this kind of thing is something that we should know but during the time of the Buddha we are talking about people who knew only two forms of Matter: Solid and Liquid; they didn't know about Gas. This word Gas came from the scientist. It was the scientist who thought thing called Gas.

The normal people always thought that this room is empty. So it was the scientist to assert this is filled with gas. Different gases present so that means they didn't know anything about gas. They knew only solids and liquids. And these two things solids and liquids, the Buddha called “*Pathavī*” (“*Pathavī-dhātu*”), “*Āpo*” (“*Āpo-dhātu*”); “*Pathavī*” and “*Āpo*”. “*Pathavī*” literally means the Earth but there the word Earth really refers to Solids; whatever is Solid is “*Pathavī*”. “*Āpo*” means Liquid, whatever is Liquid is “*Āpo*”.

And when speaking about Energy, people didn't know at that time about Electricity, Magnetism, Heat, Light, and Sound; these are all Energy, forms of Energy, and people didn't know that. The normal person knew during the time of the Buddha only two kinds of Energy: (1) one was Heat, Heat as an Energy, (2) and Motion, movement of things that is called Mechanical Energy. So he spoke about this two as “*Tejo*” (“*Tejo-dhātu*”) and “*Vāyo*” (“*Vāyo-dhātu*”). “*Tejo*” means “Heat”; “*Vāyo*” means Motion. So “*Pathavī*”, “*Āpo*”, “*Tejo*”, “*Vāyo*” was really Matter and Energy. And he also use the word “*Ākāsa*”; “*Ākāsa*” means Empty Space. Now in this room whatever is in this area is Empty Space; that empty space of course modern scientists know that it is not Empty Space it is filled with Gas. But in ancient times people didn't know about Gas, so everything was just Empty Space.

And every Solid is occupying Space, every Solid is occupying Space, and this is why we can measure that Space that it occupies. We can measure the Space in terms of Length, Breadth, and Height; Length, Breadth, and Height are measuring Space. So Space is measured by that is called Volume, the amount of Space that an Object occupies is called the Volume. So when we speak of Volume we are talking about the Space that's something occupies.

So but today the scientists have also thought about another thing that an Object occupies, not only space, it also occupies Time. A certain Object will remain in a certain place and occupy that amount of Space only for a certain period, that period is Time; how long will it be occupying that Space that is the Time. So when we speak of some Object, we have to speak in terms of Space and also Time. You see, it occupies Space and it also occupies Time.

But there is another important thing that the Buddha pointed out. How do you know that there is an Object here, and it occupies Space and Time? The only way is that your Mind is looking at it, and if there was no Mind, then there was no Existence. So there is another factor called the Mind that is looking at it. If you didn't look at it, how do you know there it existed? So whenever we think of some Existence, there must be a Mind to see that it is existing. If there was no Mind to see that it is existing, then we cannot talk about the Existence. That Mental Perception is what it's called "*Viññāṇa*"; the Buddha called that "*Viññāṇa*". So if you didn't have that thing called "*Viññāṇa*", then we will not be knowing that there's a thing there. So how can that thing be there if there's no one knowing that that was there? So that knowledge is also important here. If there was no one to see the world, will there be a world? That's very important.

You know there were three Philosophers in the United Kingdom, who came up during long time ago, somewhere in the 16th, 17th, 18th centuries, that period is what is called The Age of Enlightenment, and that those three kinds of Philosophers were call Empirical Philosophers. They brought out a very important message to the world in philosophy.

One man was Locke (John Locke); he's the one who said, he was from England, you know the United Kingdom is England, Scotland, and Ireland. Now this man from England was Locke who said, "There is no such thing as Mind; there is only Matter." And Matter is what occupies Space and Time, and there's only Matter to occupy Space and Time. What is this thing called Mind? There is not something that you can discover by looking into the World. You can't see the Mind. So he said there is no such thing as Mind; there is only Matter.

Now in Ireland there was another Philosopher, who was a Bishop, his name was Berkeley (George Berkeley). He didn't like this idea because he was a Christian, who thought the World was created by a God. And if you say there is only Matter in the world, then there is no place for God. So he brought out another argument and he said, "After all what is this thing called Matter? It is a creation of our Mind. It is the Mind that sees things. It is a Mind that can hear, smell, taste, touch. And simply what we call Matter is a Creation of the Mind, and therefore there is only Mind here; there's no such thing as Matter." That was his argument. So he brought out the importance of the Mind. When Locke said there is only Matter in this world, this man said there is only Mind in this world, there is no such things as Matter. So that created the problem; whom are we going to believe? Both seemed to me correct in their way of thinking. So people couldn't find a solution to this.

And another man came from Scotland, this was Hume (David Hume), he looked at this and said, "You're both right and both wrong at the same time." He said one man proved there is no such thing as Mind, and the other man proved there is no such thing as Matter. So that extent they're correct. And he said, "There is no such thing as Matter or Mind, there is only what is called Perception: Seeing, Hearing, Smelling, Tasting, Touching, Thinking, that is all that we can talk about. It is a result of these processes that you get this concept of Matter and concept of Mind."

During the time of the Buddha a certain “*Deva*”, now “*Deva*” is simply a person who inhabits Heaven. Today those people who inhabit Heaven, they're called Angels. We should understand the meaning of the word god. When we use the word god with the simple “g”, we are talking about some beliefs of people. Because some people believe that the Sun is the god, or the moon is a god, or they talk about the god of love, the god of war, the god of money, I don't know. There are various kinds of gods they talked about, but these gods are gods with the simple “g” not god with the capital “G”. This god with the simple “g” is simply a belief, a belief of people. No one has seen this god; these are only beliefs.

But when they talk about God with a capital “G”, they're talking about the creator of the world, the controller of the world that is that person that some people pray to get help, whether they get the help or not is a different matter. They believe in this God with a capital “G”. But one very important thing that we know about this God is this God is supposed to be all-knowing knowing everything, and he's also supposed to be very powerful, all-powerful, and at the same time this God is supposed to be all good.

So today modern Western philosophers themselves ask the question, “If this God is all-knowing, all-powerful, and all good, how can such a God create a bad world full of evil, full of crimes, full of wars, and all kinds of troubles, and threatening life with all these tsunamis, earthquakes, hurricanes, tornadoes, and all the infectious diseases, and one animal eating the other animal, one human being exploiting another human being? With all these evils in the world, how can a good God who has all the powers and all the wisdom be the Creator of the World who is in control of the world?”

These are questions that come up, but the important thing is that when we talk about the world, what are you really talking about? This is why this problem became a big problem, and these “*Devas*” came and asked the Buddha, “There is a problem which is Subjective, and there is problem which is Objective.” Subjective means something to be seen within you, and Objective means something to be seen outside. So there is a problem within and there's a problem outside. Who is able to solve this problem? What was this problem that these “*Devas*” were asking the Buddha?

So when we use the word “*Devas*” there, we are referring to the inhabitants of the Heavens, which mean that they are the Angels. So it was an Angel who came and asked Buddha about this question. **So the Buddha gave the answer in three verses, and it was the last verse that gave the answer fully, and there he points out that only the person who knows two things "Nāma" and "Rūpa". It is only when you have understood "Nāma" and "Rūpa" you solve the problem. "Nāma" means the “Name”; "Rūpa" means a “Mental Image”. So in other words, what we are talking about is simply Mental Images and the Names that we give to them; those are the only things that we can talk about. We are all the time talking about Mental Images and Names that we give to those Mental Images that is all we have to talk about.**

Now you see this kind of thing that we are talking about is what is called very deep philosophy because our normal life we are not worried about these things. Now a normal life we see Objects, and we become either attached to objects or we are repelled by the Objects. So we begin to form emotional relationships with the Objects that we see, and because of these emotional relationships we all begin to suffer. All our suffering is due to these emotional relationships that we perform. We don't even realize that we are suffering although we are suffering. We are suffering all the time because we are carried away by emotions. So this is why it is very important to understand what is really going on although we think we know everything we don't know anything; this is the problem.

So this is why the Buddha has been trying to find out because most people they are trying to find out what is the origin of all these things, and so the Buddha is trying to explain this, and that is what the Buddha talks about in this Sutra called “*Aggañña Sutra*”. “*Agga*” means “the end”; “*Agga*” is the word for “end”. So when we talk about “ends”, we can talk about “ends” in Space or we can talk about “ends” in Time. Now when we talk about the end in Time, there are two ends: one is the end in the Past and the other is the end in the Future. The end in the past is the Birth, and the end in the Future is the Death. So we have two ends there: Birth and Death. So that is what we call Life. Life has two ends: a Birth and Death. And in between Birth and Death is what we call Aging. So we have Birth, Aging, and Death that is what we call Life.

When someone is born people begin to celebrate birthdays, and they are very happy about being born, but when someone dies they begin to cry and lament, they don't like to die, they like to be born, but unfortunately every person who is born has to die; that means there's no permanent Existence. So Existence itself is not a pleasant thing. Of course children like the aging process; that means they want to grow up and become adults, but once you become an adult, then the aging process continues to make you old, you don't like to grow old, you want to be young all the time. Now that is also impossible you see.

So it is very important to understand this problem, and the problem, this is the problem of Existence, and the problem is, are we really existing? When it comes to that problem, are we really existing; then the question arises; we are may be not really existing because we are changing all the time. If we are changing all the time, because Existence is what is called a Static Concept in a Dynamic Reality; the Reality is Dynamic, which means changing all the time, but Existence is a static concept as if there's no change going on. So in another word, Existence becomes a fallacy; it's not true. So this is why it is the Delusion; it is called a Delusion, we are suffering from a Delusion. So we are our problem is to get out of this Delusion; only when we are free of this Delusion that we become happy.

Otherwise, we are struggling to exist, and this is what Charles Darwin saw as the cause of this thing called Evolution, the Struggle to Exist and the Survival of the Fittest; that Struggle to Exist and the Survival of the Fittest that he called Natural Selection. So that process kept on, this process called Evolution, until the human being came into being. But human being didn't start as a human being, it started as a molecule and a molecule of a special kind, which can produce molecules of its own kind by absorbing atoms from the surrounding, and that is that thing called Life. So Life was going on unconsciously, there was no real conscious doing of anything. It was happening unconsciously, and it was happening due to the presence of the Necessary Conditions, following the law of Determinism, the Law of Determinism.

So now it was in order to understand this fully that we have to be talking about this “*Aggañña Sutra*”, and today we hear of a thing called The Big Bang Theory. Why did these people think of a thing called The Big Bang Theory? Because these astronomers were people who used telescopes of very high, highly advanced telescopes, where they could see things far away. And one thing they observed was that the distance between the stars were gradually becoming longer and longer, but this was observed only because they were looking at this every year; every year a slight difference in the distance between two stars.

So they began to see that the distance is becoming more and more. So they thought the Universe is expanding. If the Universe is expanding, that means there must have been a time when the Universe was very small, and that means from a very small situation it started expanding. It's like the fireworks. When we see the fireworks, you see something exploding and being thrown out. So in similar way this small particle must be breaking up and expanding like that. So that is why they thought of a thing called The Big Bang, started with The Big Bang, and that was The Big Bang Theory.

But now gradually other scientists are now beginning to think in a different way. There is another theory called the Oscillating Universe Theory; that means they have begun to think that maybe it's not just a big bang starting everything. But this is being repeated; it is expanding then again contracting, and then again expanding, and so on. That is the other Theory which is called the Oscillating Universe Theory. Oscillating means like the clock; the pendulum is oscillating.

And so in a similar way, actually if we study the teachings of the Buddha, we find that the Buddha is talking about this oscillation, so this is why I said that whatever the modern scientists are gradually discovering has already been spoken of by the Buddha. The Buddha knew better than the scientists. So he spoke about what is called the “*Maha kalpa*”, “*Maha kalpa*”. “*Kalpa*” is a Period, a great Period. And that Period means that the Universe starts like a small spot and gradually begins to expand. And then comes a time when the expansion stops, and it will remain like that for a certain long Period. And then it begins contract again. It starts contracting gradually and ultimately it will come to a small place and then disappear completely.

And there will be a time when the Universe will be absent for a long period, and again it begins to form. Now if we are talking about Matter and if the Universe is all made of matter, then what has happened to the Matter? The only thing that we can talk about is that the Matter has turned into Energy. So the Matter when it begins to gradually contract and disappear, that means all Matter has turned into Energy. And there the Buddha is talking about Energy Worlds; there are also Worlds which are simply Energy. Those Energy Worlds are called the “*Abhassara Loka*”. “*Abhassara*”, “*Abha*” means Radiation; “*Abha*” means Radiation. So there is only Radiation there; there is no Matter.

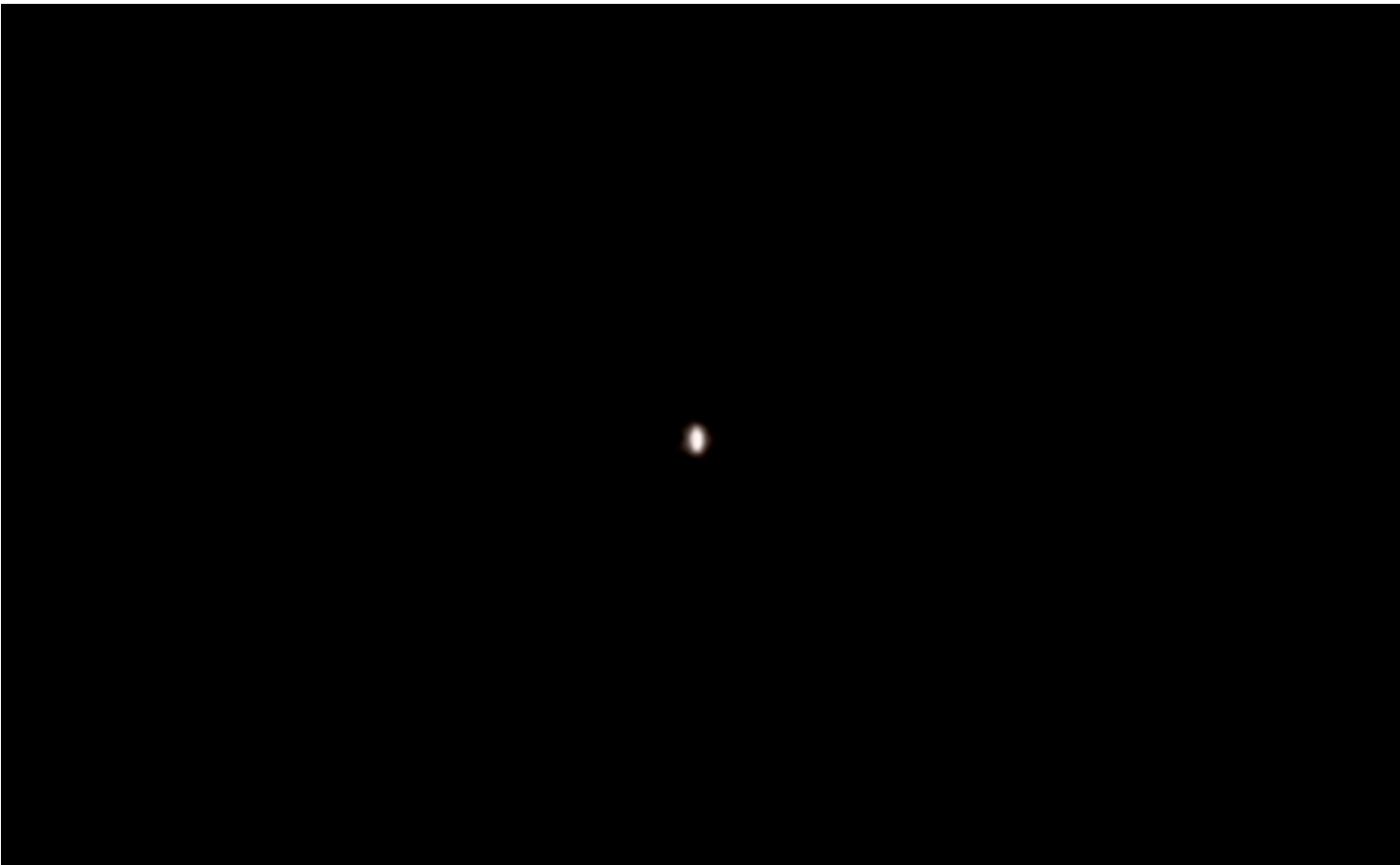
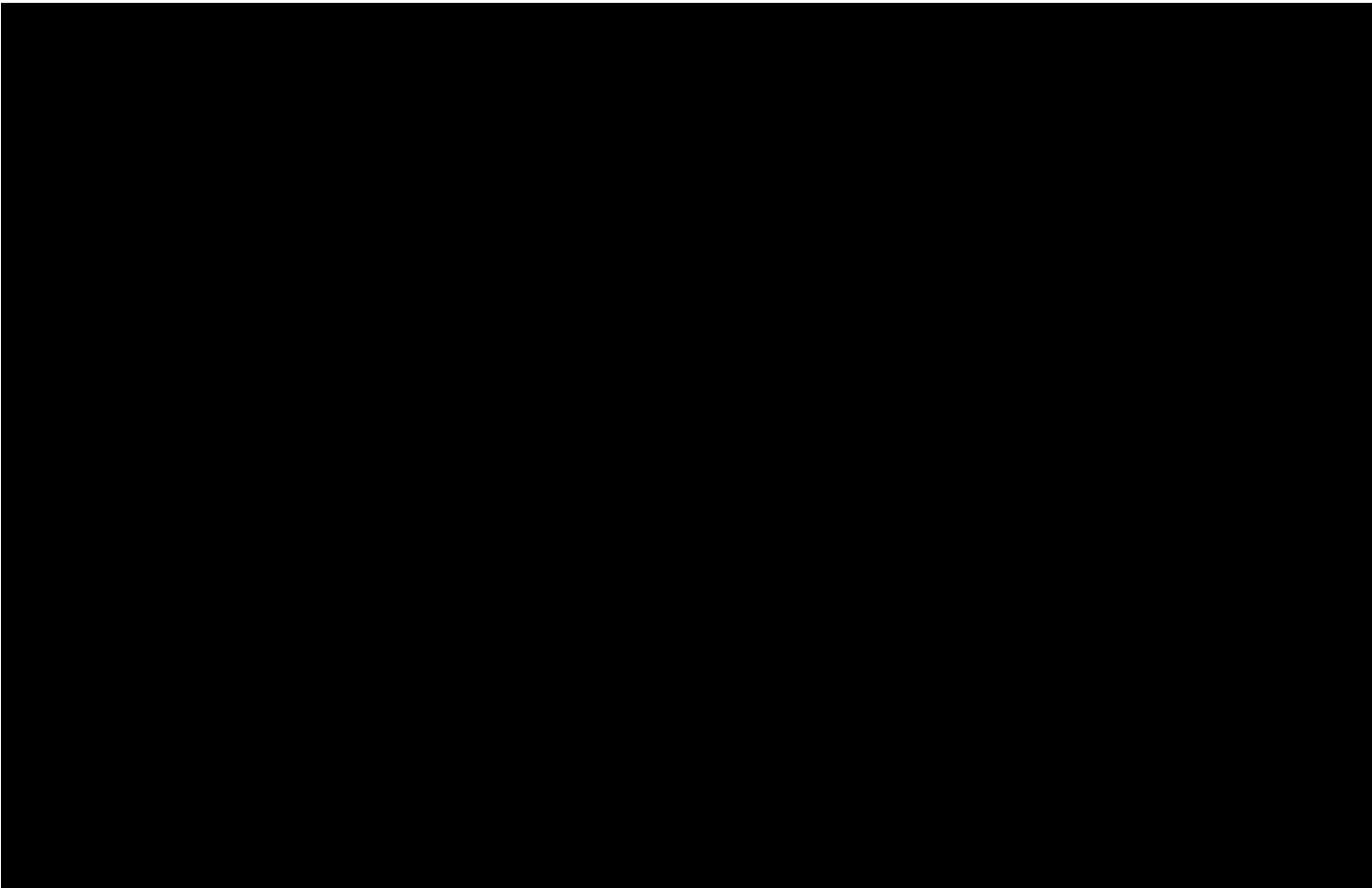
And then again that Matter begins to form again, and just starting like a speck and gradually begins to expand again. Now that whole Period is a Cycle, and One Cycle is called the “*Maha kalpa*”, “*Maha kalpa*” is that. And this “*Maha kalpa*” is divided into four parts: (1) the Expanding Period, (2) the Stationary Period, (3) then the Contracting Period, (4) and the Absent Period. So these four “*Kalpas*” are also very long Periods. So the Expanding Period is called “*Vivatta*”, “*Vivatta*” Period, “*Vivatta kalpa*”. And the Stationary Period is called “*Vivattati*”. And then the Contracting Period is called “*Sanvatta*”. And the Absent Period is called “*Sanvattatthay*”. And again the “*Vivatta*” Period starts.

And so it goes on without end, and ultimate beginning cannot be found. It goes on like that. So everything in the Universe is really happening in circles or Cycles. Everything is happening in Cycles, and not, there's no real beginning and real end. That is what the Buddha pointed out. And so I think for the day we can stop here, and we can also begin to see some movies. Our friend is going to show you some movies about these things.

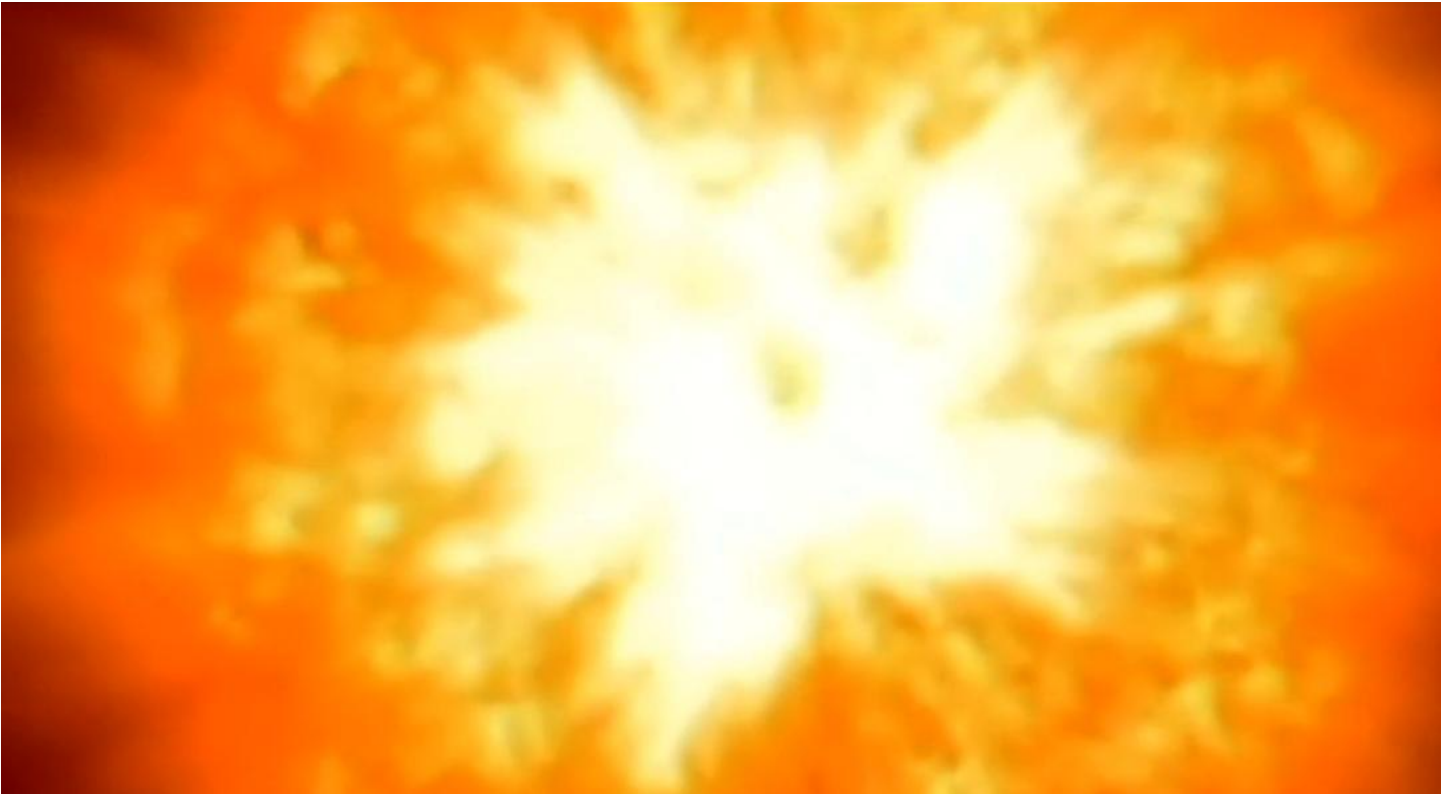
THE BIG BANG THEORY

- In the 1920s following astronomer Edwin Hubble's discovery of an expanding universe, cosmologists generally accepted the "Big Bang" theory as the prevailing theory for the "beginning" of the universe;
- In recent years, cosmologists now believe the "Big Bang" was not how the universe began, but rather how the universe evolved;
- Einstein's famous equation showed that Mass and Energy are interchangeable, which helped explain the "Big Bang" phenomenon.

Thank you, Bhante. I'm going to show two sets of videos the first set is about the Evolution of the Universe. I'm sure all of you have heard of The Big Bang Theory. It all began following astronomer Edwin Hubble's discovery of an expanding Universe. Cosmologists generally accepted the Big Bang Theory as the prevailing theory for the beginning of the Universe. So in recent years Cosmologists now believe The Big Bang was not how the Universe began but rather how the Universe evolved. They had no idea what happened before The Big Bang. Einstein's famous equation $E = MC^2$ showed that mass and energy are interchangeable that helped to explain The Big Bang phenomenon.



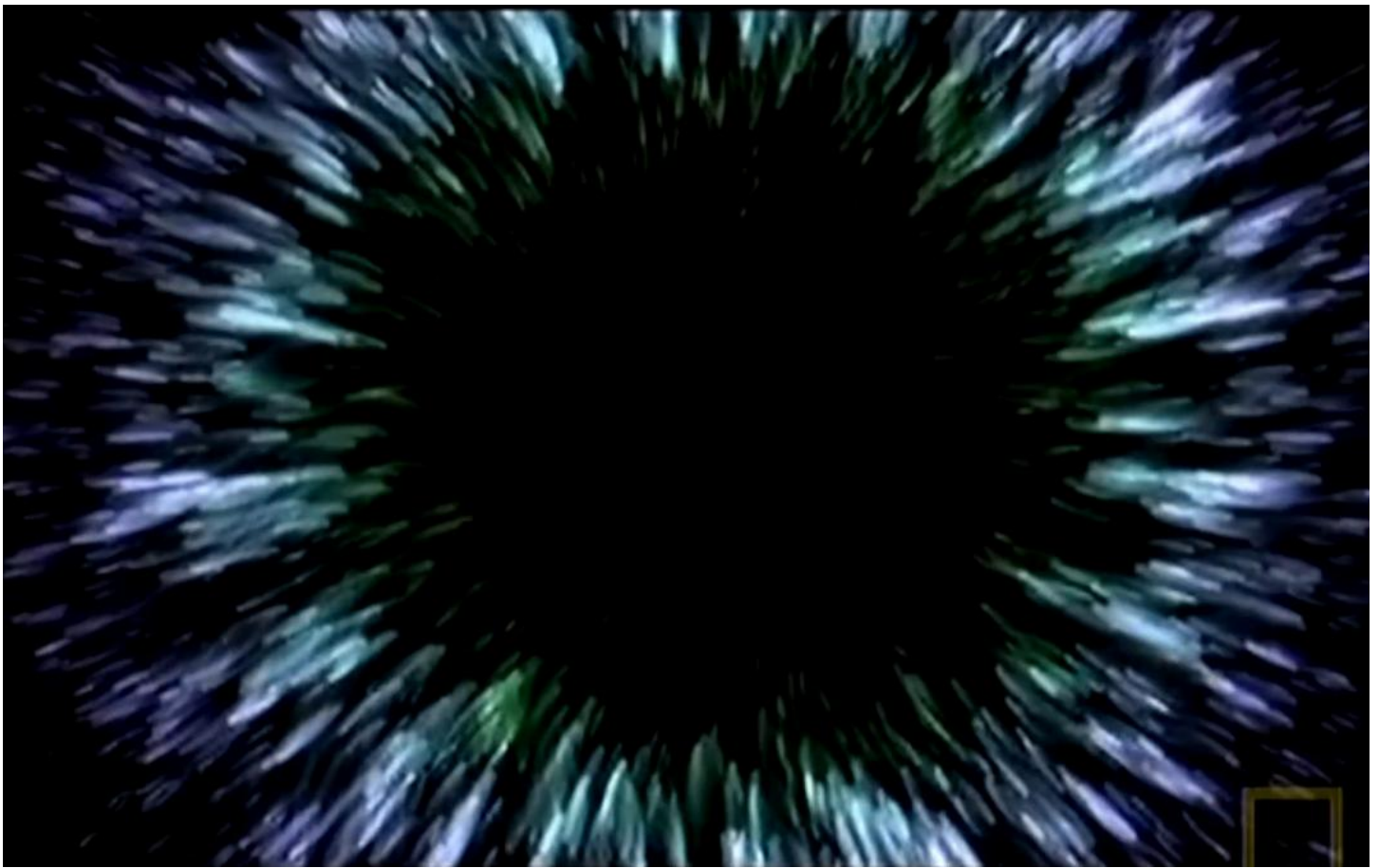




In the beginning there was nothing; no space, no time, and then there was light. Suddenly a tiny speck of light appears. It was infinitely hot. Inside this tiny fireball was all of space.



This was literally the beginning of time. The cosmic clock was ticking. Time could flow and space expand.





At the earliest moments of The Big Bang if you take it back to T equals zero, everything in our Universe, everything we can see, all the matter, and all the energy, in all of the galaxies was once contained in a region smaller than the size of a single atom today.



The idea that our universe was once tiny originated from the brilliant work of American astronomer Edwin Hubble.

Back in the 1920s most astronomers believe that everything visible in the night sky were stars and they were part of our galaxy, The Milky Way.

But Hubble wasn't convinced. He studied a swirling cloud of light called the Andromeda Nebula and showed that it was a Star City, another galaxy far outside of our own Galaxy.

He showed that these other galaxies were speeding away from ours, and the further away they were, the faster they seem to be moving. The Universe was expanding, and if the Universe was expanding, then it's some point in the past it must have been smaller, much smaller, and that it must have had a beginning.

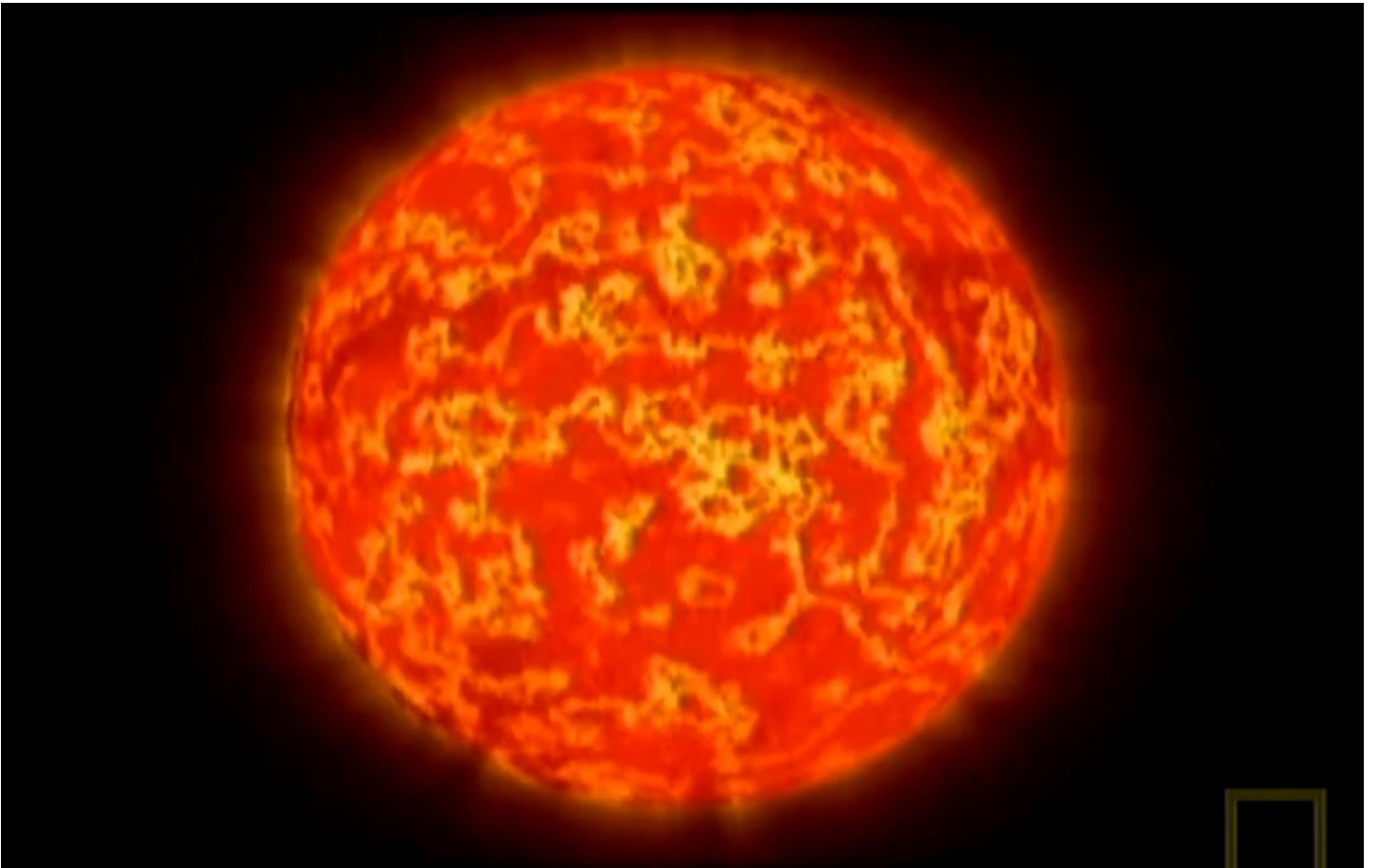


The idea of the big bang was born.



Theoretical physicist David Spergel is a Big Bang expert.

The Big Bang Theory is not really a theory of how the Universe began. It is really a theory of how the Universe evolved.



No one knows exactly what happened during The Big Bang, but scientists do know that a fraction of a second after the Universe was born this tiny super hot fire ball was already starting to expand.



We don't know how the universe began so we start our story with the Universe was a billionth of a billionth of a billionth of a billionth of a minute old; pretty young. The Universe was the size of a marble.

Less than a trillion trillionth of a second after the big bang, the marble-sized universe was very unstable and underwent an enormous growth spurt.

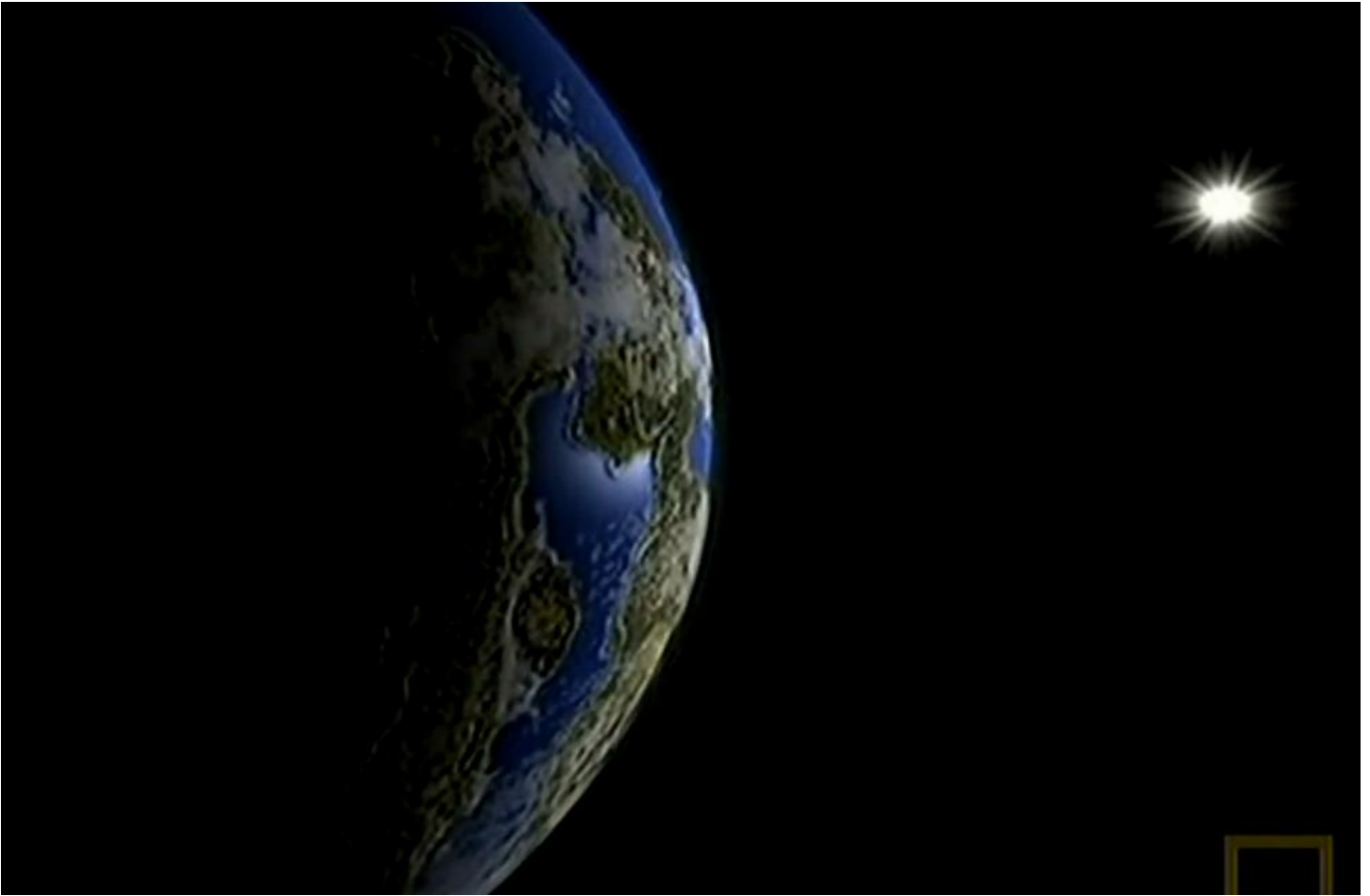
During this period of incredibly rapid expansion, space itself was expanding faster than the speed of light.



In the same way that this hot glass ball inflates so did the baby universe expanding in all directions at once and as it expanded it cooled.



A trillion trillionth of a second after the big bang, the universe was small enough to fit inside the palm of your hand.

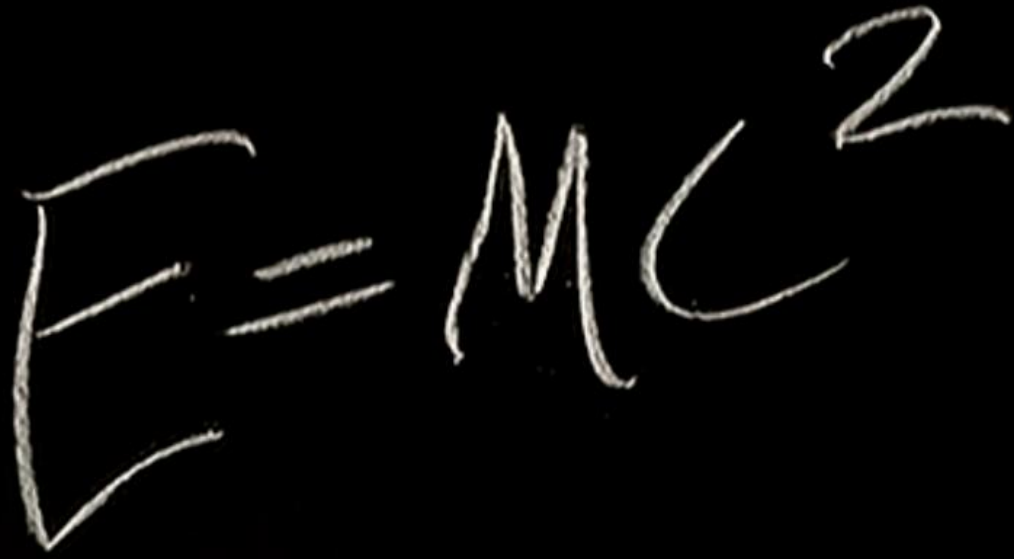


A tiny fraction of a second later it was the size of Mars.

Another fraction of a second and the baby Universe had grown to 80 times the size of the Earth.



A trillionth of a second after the big bang and our newborn Universe was still expanding but it didn't contain matter it was Pure Energy.

A photograph of a blackboard with the equation $E=MC^2$ written in white chalk. The chalk is slightly smudged, giving it a hand-drawn appearance. The background is solid black. In the bottom right corner of the blackboard, there is a small, empty yellow square.

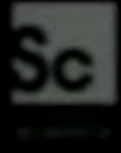
Einstein's famous equation E equals MC squared show that mass and energy are interchangeable.

OSCILLATING UNIVERSE THEORY

- In the 1930s, Albert Einstein proposed the "Oscillating Universe Theory" which suggested the universe undergoes endless cycles of oscillations, each beginning with a "big bang" and rapid expansion, and ending with a "big crunch" and rapid contraction;
- New generation of cosmologists are now investigating this theory – that there was not one singular "Big Bang", but rather there had been a continuum of multiple "Big Bang".

Okay you've just seen the single Big Bang. You've heard Bhante mentioned the Oscillating Universe Theory. It all started with Albert Einstein in 1930 when he suggested that the Universe actually expanded and then contracted. The new generation of cosmologists is now investigating this theory that there was not one singular Big Bang but rather there had been a continuum of multiple big bangs.

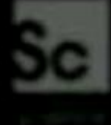
"BIG BANG THEORY"



**Act I : Single "dot" of energy
comes into existence out of nowhere.**

Act one: A Singularity pops into existence out of nowhere and no when, containing in one single dot all the energy that will ever be in our Universe.

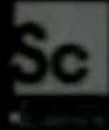
"BIG BANG THEORY"



**Act II : "Inflation" - unimaginably
rapid expansion of space.**

Act two: Inflation suddenly takes hold, an unimaginably rapid expansion of space smoothly spreading out that energy, bringing order to the universe. It's now a massive soup of evenly expanding plasma.

"BIG BANG THEORY"



Act III : The universe cools, matter forms stars, galaxies, and planets.

Act three: The Universe cools. Matter starts to clump together under the force of gravity, eventually forming stars, galaxies, and planets.

For most cosmologists, this three-act play is the best explanation for what happened at the beginning of the universe, but not for everybody.



Interpreting this as a beginning is indeed just a crutch. It's not derived from any theory. It's just a place where the theory itself breaks down.



Dr. Martin Bojowald is a Professor of Physics at the institute for Gravitation and the Cosmos at Penn State. He's a rising star in a new generation of cosmologists which is challenging some long-held beliefs about the Universe. Inflation may have fixed act two, but Martin thinks the play still starts with a very unlikely act one -- the sudden and singular pop from nothing into the entire Universe.

A singularity just means we don't understand the theory well enough.





So, we have this balloon Universe. If we imagine what it could have been before the Big Bang, it was collapsing, so the volume was shrinking. Now if we follow the usual Evolution, according to general relativity that would have been ending in a singularity; the whole balloon would just completely deflate.



But with the atomic nature of space and time, the attractive behavior of gravity changes; it becomes repulsive at these high densities. The collapse stops. Then the forces turn around, so there's a repulsive force which makes the Universe re-expand.



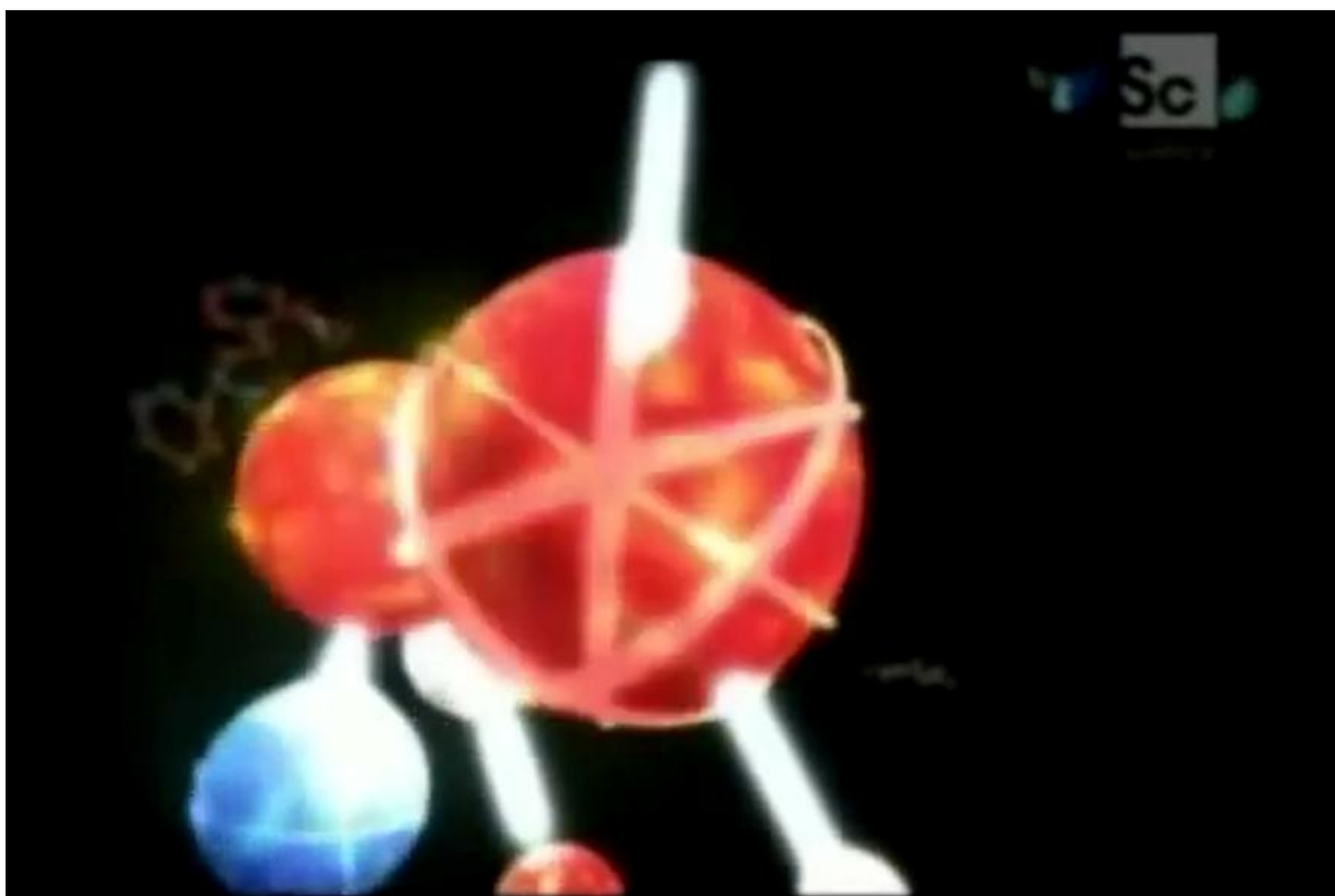
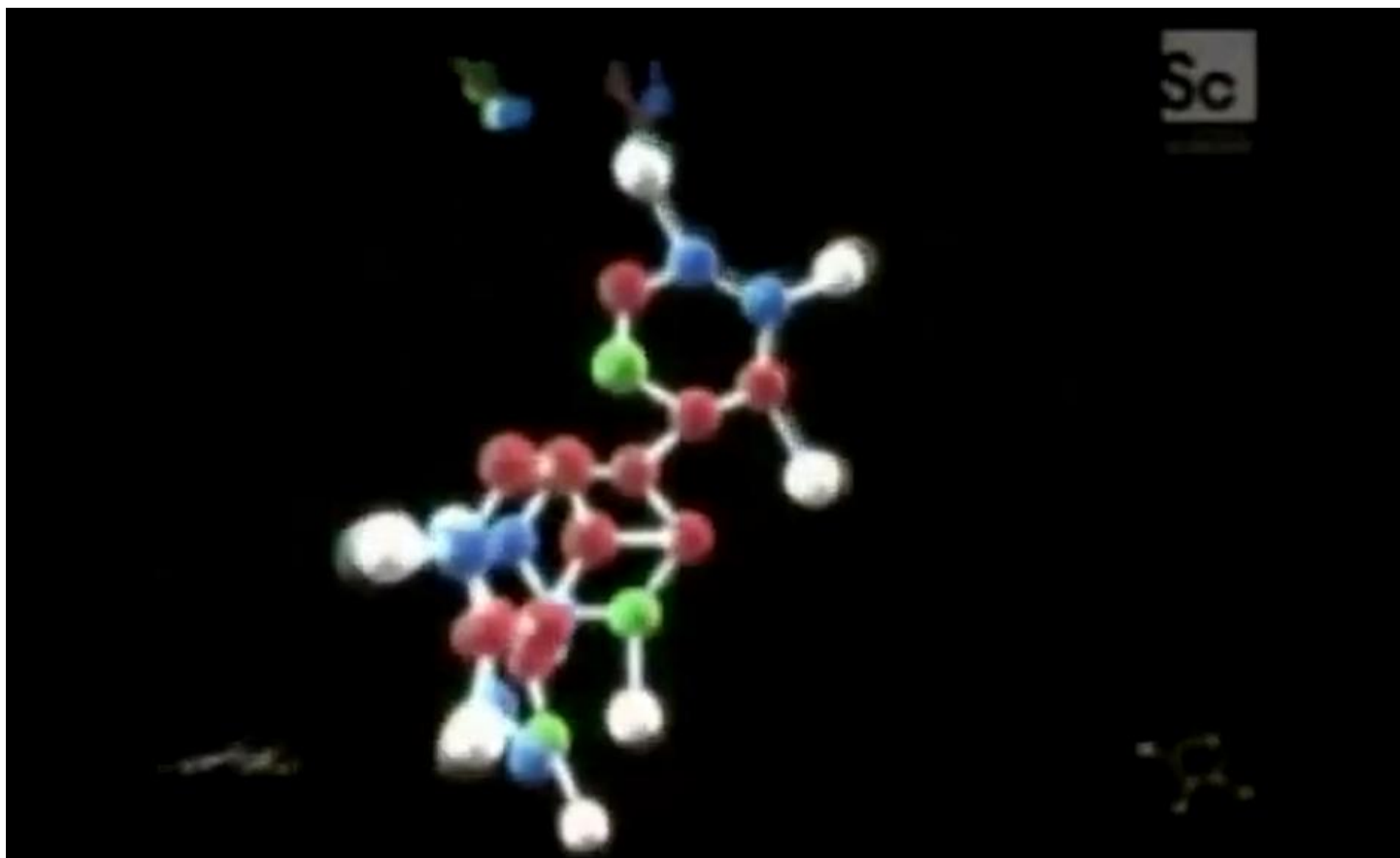
At some point, we're not sure yet, but it might re-collapse at some time in the future, so all the air might go out again. The volume would decrease, the density would increase, and then probably approach another Big Bang.

The universe expands and contracts but it never actually begins. There could have been a series of universes before this one and more to come after this one.

SUB-ATOMIC PARTICLES

- In the 1920s, scientists were still puzzled by what the atom was really made of. No one knew what was inside the nucleus of the atom.
- Max Planck, who was awarded the Nobel Prize in Physics in 1918 for his work in quantum physics and the relationship between matter and energy, wrote at the time: *“As a man who has devoted his whole life to the most clear headed science, to the study of matter, I can tell you as a result of my research about atoms this much: There is no matter as such. All matter originates and exists only by virtue of a force which brings the particle of an atom to vibration and holds this most minute solar system of the atom together...”*

That was about the Universe; that is the outer space. Let's take a look at Inner Space, and that is the Atom, but a hundred years ago scientists had no idea what the Atom was made of. Max Planck, who was known as the father of quantum physics, was awarded the Nobel Prize in physics in 1918 for his work in quantum physics, and the relationship between Matter and Energy. He wrote this statement but he never published it until 20 over years later; the main point he mentioned there is that there is no Matter as such.

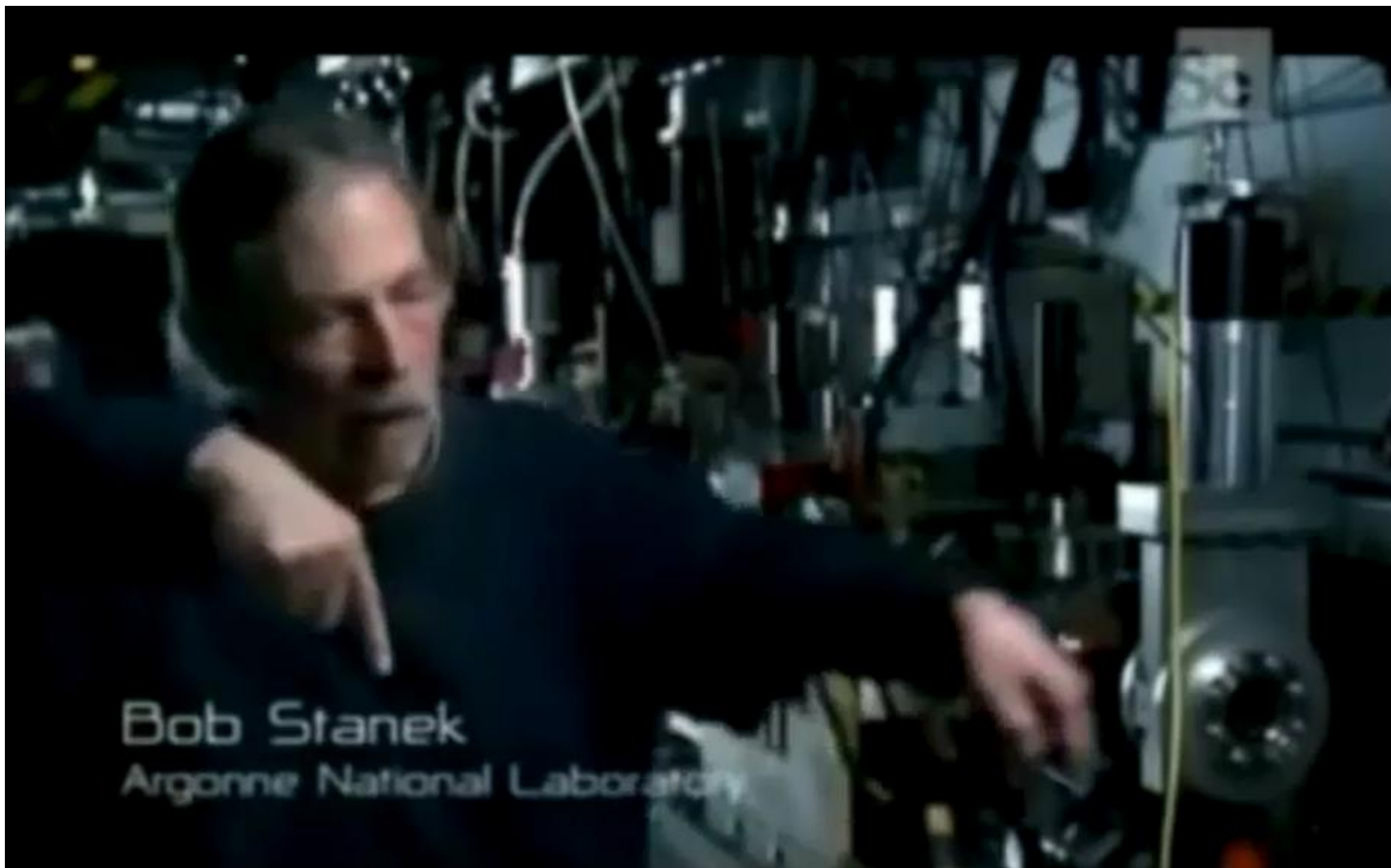




Particle accelerators like giant microscopes that let us peer into the subatomic world. they break matter down into its smallest components drilling down far enough to detect antimatter requires taking proton from an atom's nucleus trapping them in the vacuum then shooting them into a ring of giant electromagnets.

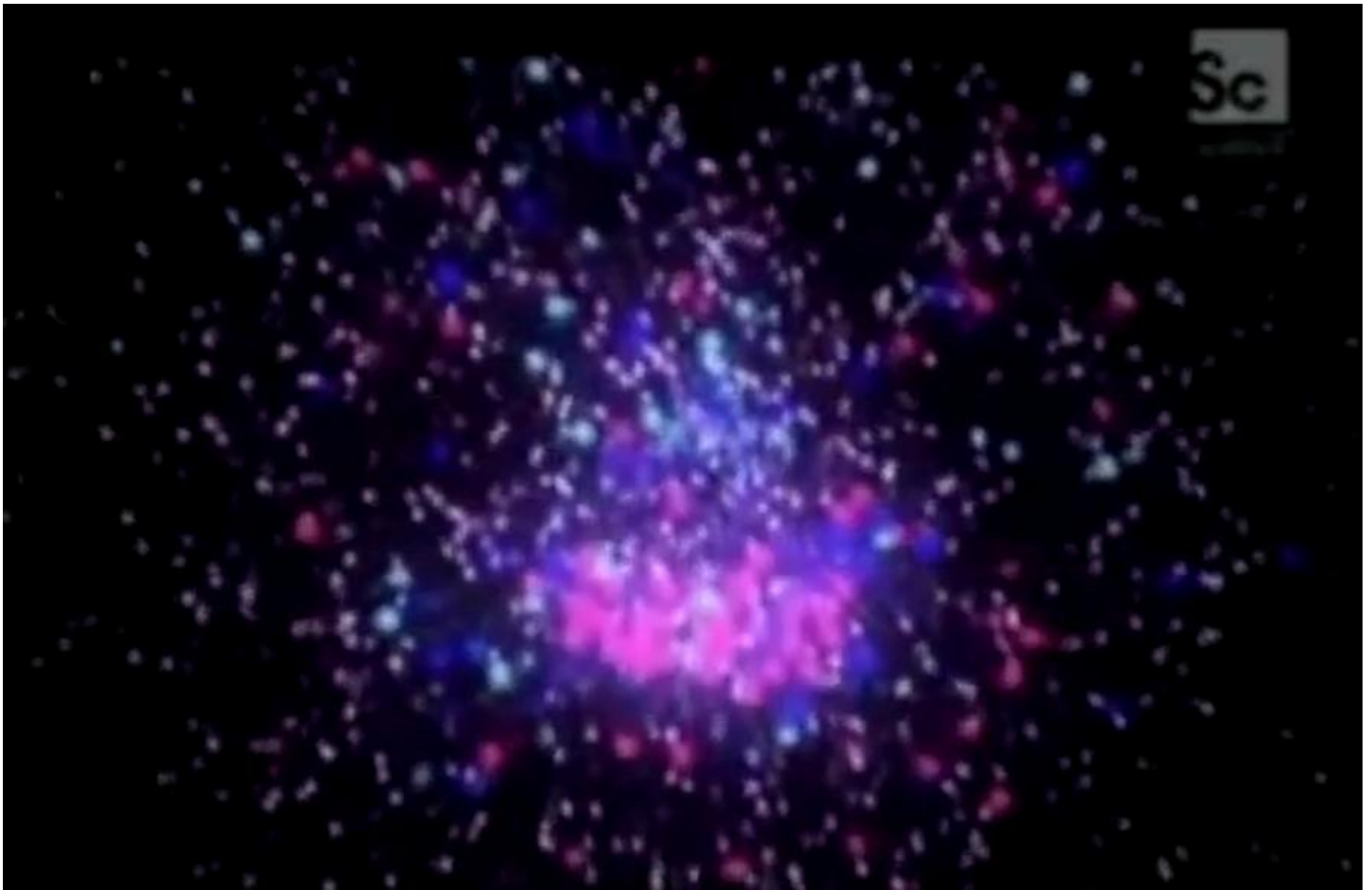


So particle accelerator works by starting protons going around in a circle in a ring. And every time they go around, you give them a little kick with electric field, so they get going faster and faster and faster and faster and faster until they're almost the speed of light. While they are going almost the speed of light in a real particle collider but here they are not going that fast yet.





So protons in this direction interact with protons in this direction, and at some point they come like a car crashing together. And you can imagine what happens if car crashes together, pieces fly all over, and around that interaction point where the cars crash together is where we have our Detector. So when this happens millions and millions and millions of times every second.



When you break protons apart, you release incredible amount of energy strange things come out of the explosions, including tiny particles that flare into existence and disappearing billionth of a second.

"THERE IS NO MATTER AS SUCH"

- Scientists have been experimenting for decades with particle accelerators and particle colliders to determine what the atom and sub-atomic particles were made of;
- Towards the latter part of the 20th Century, scientists finally satisfied Max Planck's original suggestion that there was no matter as such, there was only energy.

Scientists have been experimenting with particle colliders trying to find out what's inside the Atom. They shoot protons in opposite direction and collide them to break them apart to see what is inside. They finally discovered that is really nothing inside; there is only energy. That satisfied Max Planck's original statement; there is no Matter as such there's really only Energy inside.

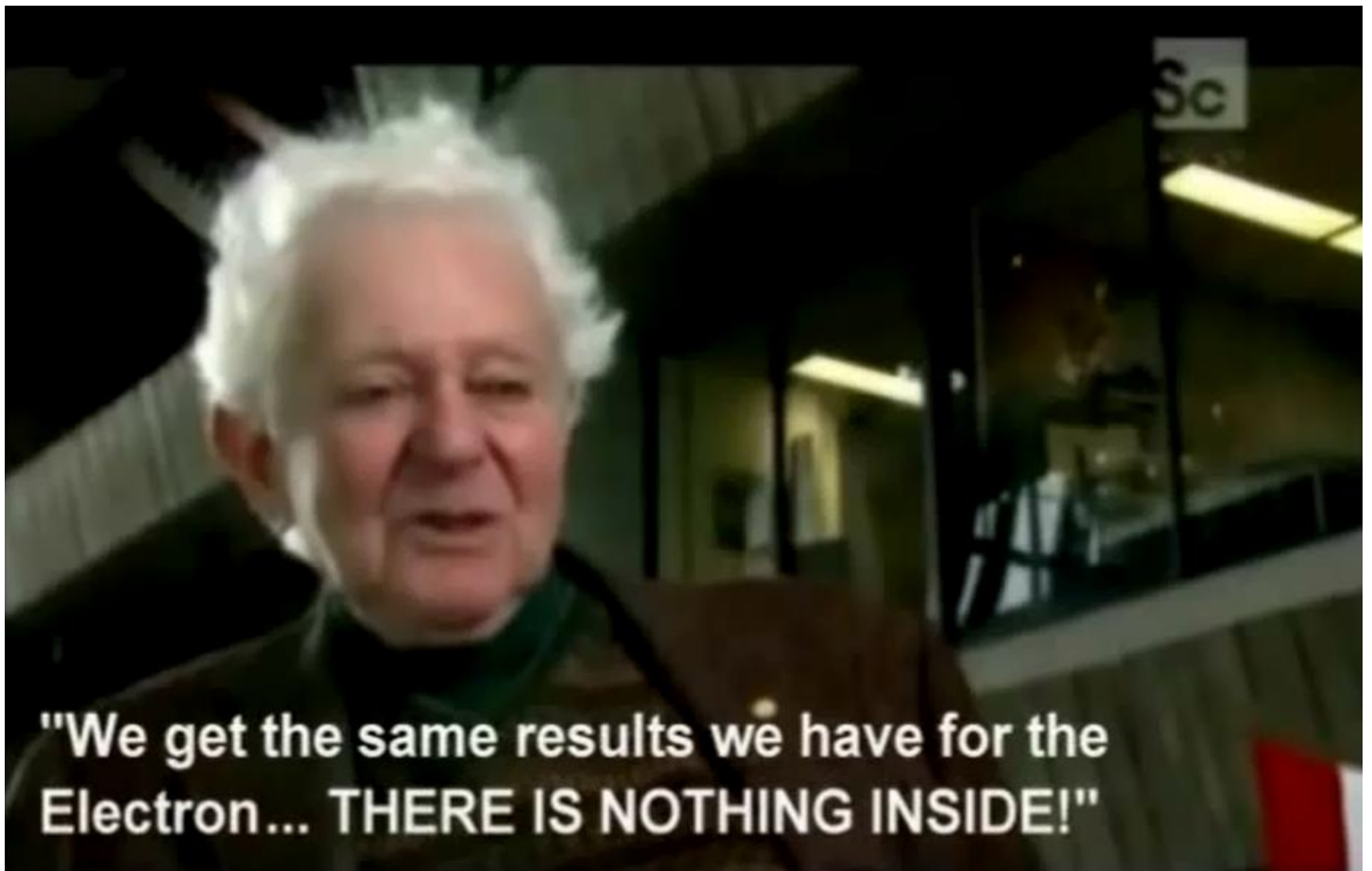


Today after years of reading these subatomic tea leaves physicists feel they are getting closer to answering the question what are we really made of.





Most of the atoms in our body are made of nuclei and electrons, and the nuclei themselves are made of protons and neutrons, and the protons and neutrons are made of quarks. And, of course, you say, "What are the quarks made of?" And that's where we're stuck. For the last 40, 50 years, we've been studying the quarks, trying to find something inside, and we get the same results we had for the electron.



There's nothing inside. The quarks don't have any size. The size, the radius of a quark is zero.





It's a little bit like "Alice in Wonderland." Remember when Alice saw the Cheshire Cat sitting on the branch of a tree with a big smile? And much to Alice's great astonishment, right in front of her eyes, the Cheshire Cat started to disappear. And finally poof! It was gone. But it left behind one component its smile.





That quark smile is a tiny box stuffed full of energy. All matter is actually made of energy that has congealed into particulate form. So that appears to be what we are made of.

Venerable Punnaji: Well you saw it hah? The important thing is that our friend Billy has been very useful all these days by illustrating all of what we have been speaking about. But unfortunately he will be away for three weeks coming in the future, and still we'll be going on. The classes will be going on without him but he'll be back again after three weeks, and we'll be able to see the pictures again. So we should thank him for helping us all these days, and also we'll be expecting him again the next time. But of course during these three weeks, we are really talking about three days, or three classes and we'll be going into the fundamental things and will be prepared to, the mind will be prepared to receive the higher things again. So we'll go to lower level in our talks these three weeks, lower doesn't mean that it's not important, but they're all going to be the more basic things that we should know before we can get into the higher things.

So someone has been asking the question why don't we talk about "*Abhidhamma*"? Well what I have discovered through my research is that what is today call "*Abhidhamma*" is not the real "*Abhidhamma*" that the Buddha spoke of. And if we begin to talk about "*Abhidhamma*", we'll be talking about the real "*Abhidhamma*" that the Buddha spoke of and that is what we were talking about today also, and the "*Paṭicca-Samuppāda*" is the real "*Abhidhamma*" that the Buddha spoke of. So we'll be speaking about these things more and more. And the most important thing is to understand that what we call Experience is both Subjective and also Objective. And so when we begin to talk about the Experience in more detail, we'll be really talking about the "*Abhidhamma*". So that we'll get into next time you have any questions to ask at this moment?